Technical Developments

Developments in 2010 - Summary

Developments focused on the user needs, ease of use and maintenance.

Proposed hardware and software improvements:

- Beam position monitor (CO, JJ, VS)
  - installed and commissioned, integrated into EPICS (KQ, JJ)
- Sample visualization (KQ, JJ)
  - Optics realigned, focus motor replaced
- Sample detection sensors for improved remote access
  - laser sensors installed and tested (KQ)
- Interlocked beam stop (JJ,CO)
  - designed and under construction (JJ, CO, EL)
- Monochromator cleaned and commissioned

Developments in 2010 - Summary

On going hardware and software improvements:

- Ø Fluorescence detector upgrade (JJ)
- Ø Interlocked beam stop (JJ,CO)
  - designed and under construction (JJ, CO, EL)
- Ø Upgrade and commissioning of data collection workstation (KQ, JJ)
- Ø Self-scheduling calendar for access to insertion device beam time, available for the 2nd cycle, FY11. (KQ).
- Ø Autocentering (KQ, JJ, AJ*, VS)

*collaborations with members outside the group

Status update – X6A environment

Proposed hardware and software improvements:

- Ø Improved He flight path for improved signal (JJ, EL, VS)
- Ø Automounter upgrade (RN*, JJ, KQ, EL,VS)
- Ø Focusing Optics

- KB mirrors > viability studies, ray tracing (MH*, VS)
- Kinoform lenses > preliminary experiments (KEL*, KQ, JJ,VS)
  - Ø DCS robustness (KQ, JJ)
  - Ø Diffraction quality analysis integration (KQ, JJ, VS)

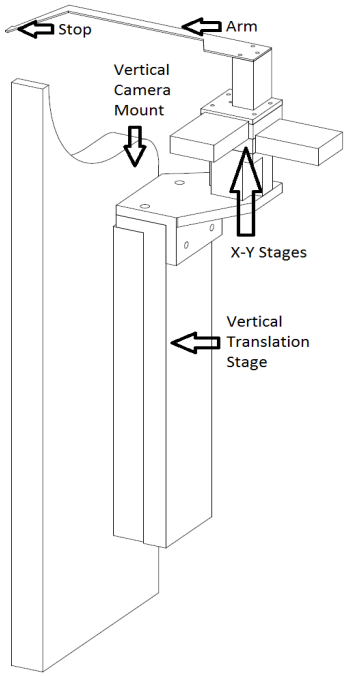
*collaborations with members outside the gr

Interlocked beam stop

Christopher Owen – SULI DOE summer intern

Jean Jakoncic

Interlocked beam stop



Final design of the beam stop translation assembly (left). The system is viewed from the back and shown attached to the crystal viewing optics and camera assembly.

Autodesk software Inventor 10 and CAD were used to design the assembly.

Automounter Upgrade

By Jean Jakoncic, Edwin Lazo
Kun Qian
Vivian Stojanoff
Robert Nordmeyer*

Automounter Upgrade

Increase the number of pucks from 4 to 7

- Initial software (Earl Cornell) contains provisions for 7 pucks;
- Dewar and stages will be replaced;
- Design, construction and assembly will be by R. Nordmeyer.

Current dewar on X6A can hold only 4 pucks

X6A

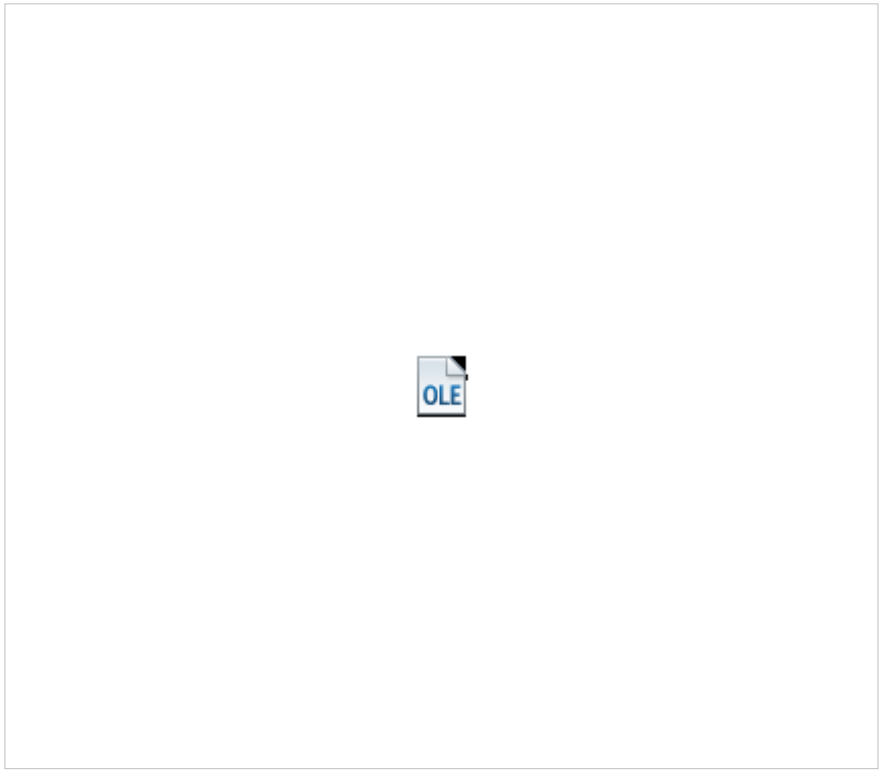
NSLS

NIGMS

KB mirrors for X6A: a case study

By Marcelo Honnicke

KB mirrors for X6A: a case study

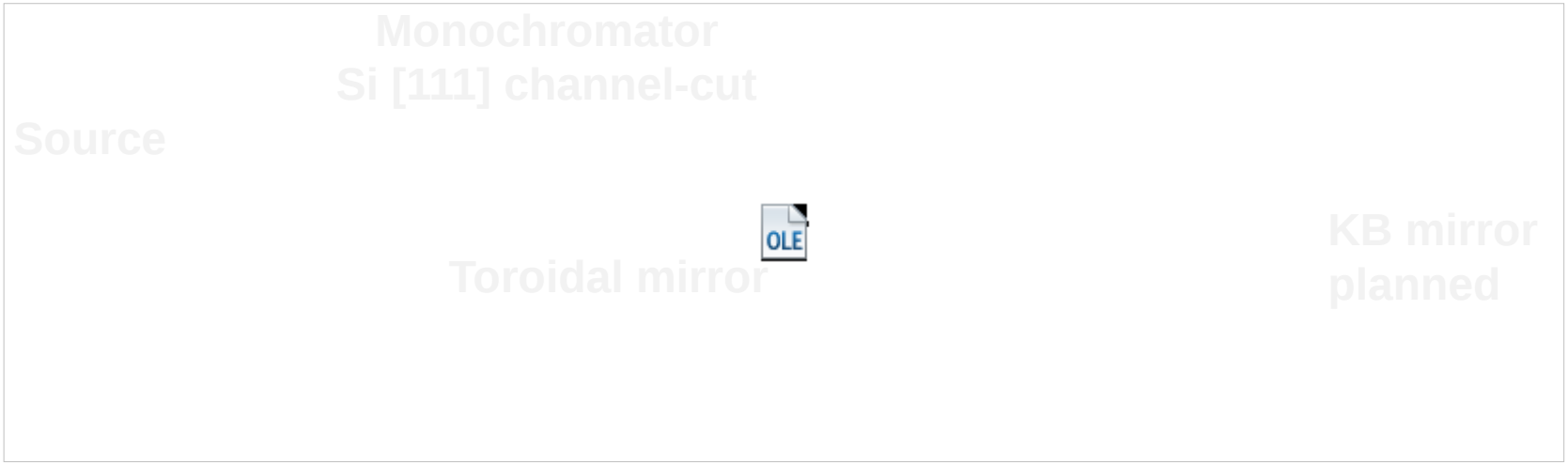


Ray tracing program: **SHADOW**
Parameters used for the X6A beam line

Stored Electron Beam Energy:
2.800 GeV.
Maximum Operating Current:
300 mA.
Dipole Bend Radius:
6.875 meters (B ~ 1.36 Tesla).
Horizontal Emittance (εx):
6.6 x 10-8 rad.m.
Vertical Emittance (εy):
2.0 x 10-10 rad.m (εz, in SHADOW).
Source Size (σx,σy):
330 μm, 62 μm (σx,σz in SHADOW).
Source Divergence (σx′,σy′):
280 μrad, 11 μrad (σx′,σz′ in SHADOW).

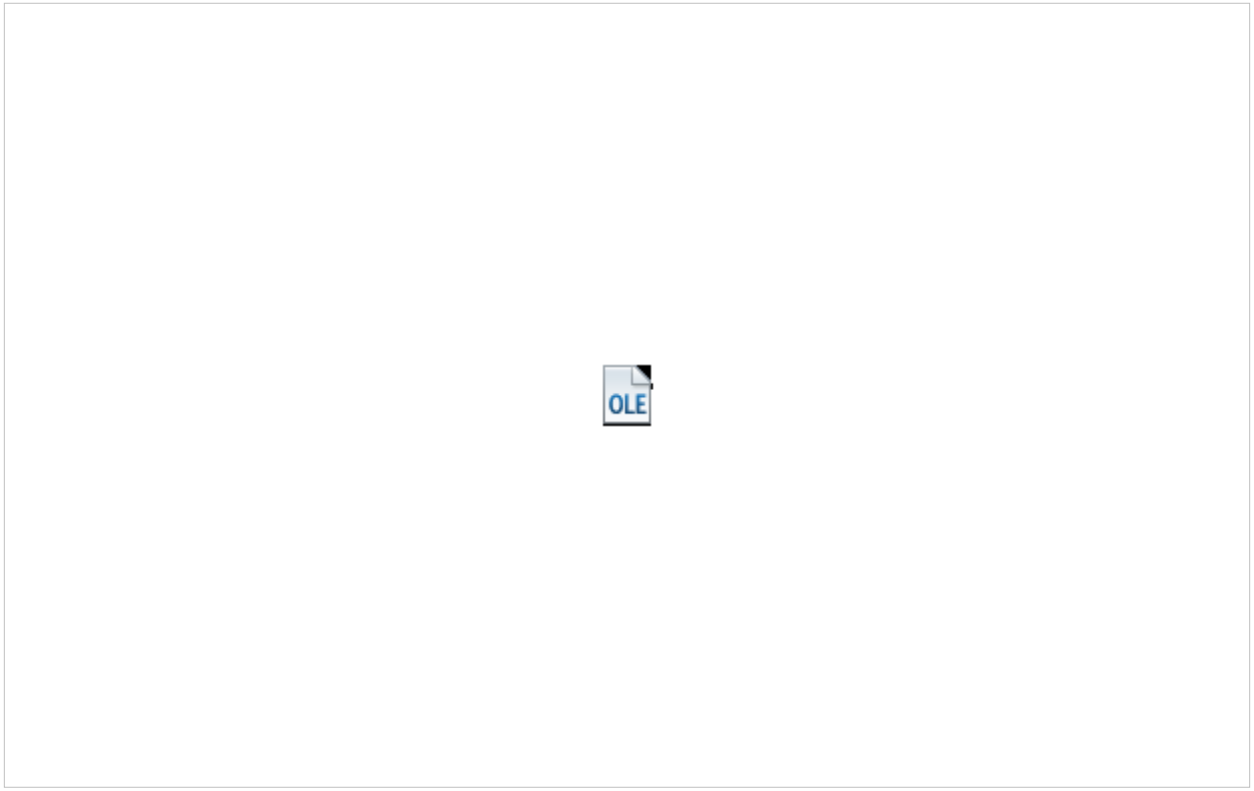
NSLS bending magnet emission spectra. Energy range: 0.5eV to 55 keV.

KB mirrors for X6A: a case study



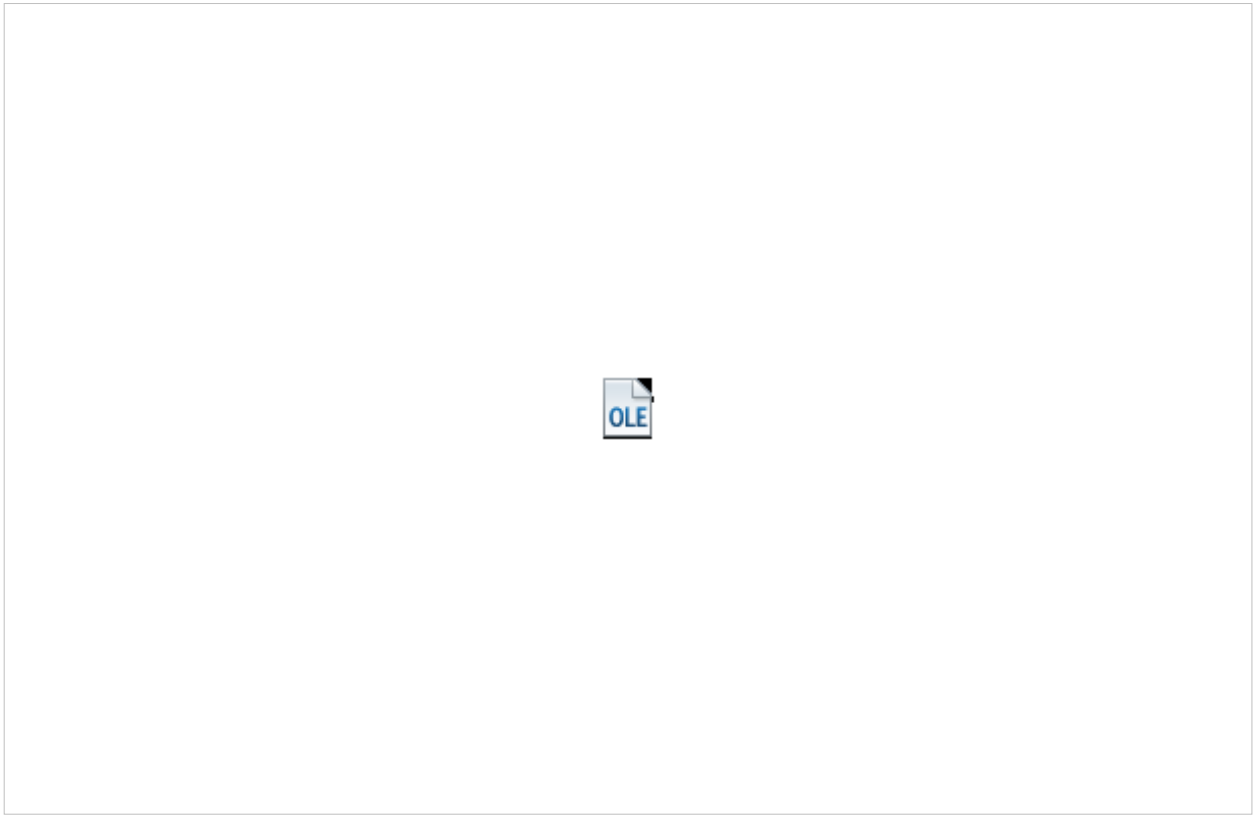
X6A beam line optical elements from left to right: 1. source, bending magnet; 2. channel cut Si [111] monochromator; 3. toroidal mirror; 4. planed KB mirrors; 5. sample position. Green squares represent the position where the beam cross section was imaged with SHADOW.

KB mirrors for X6A: a case study



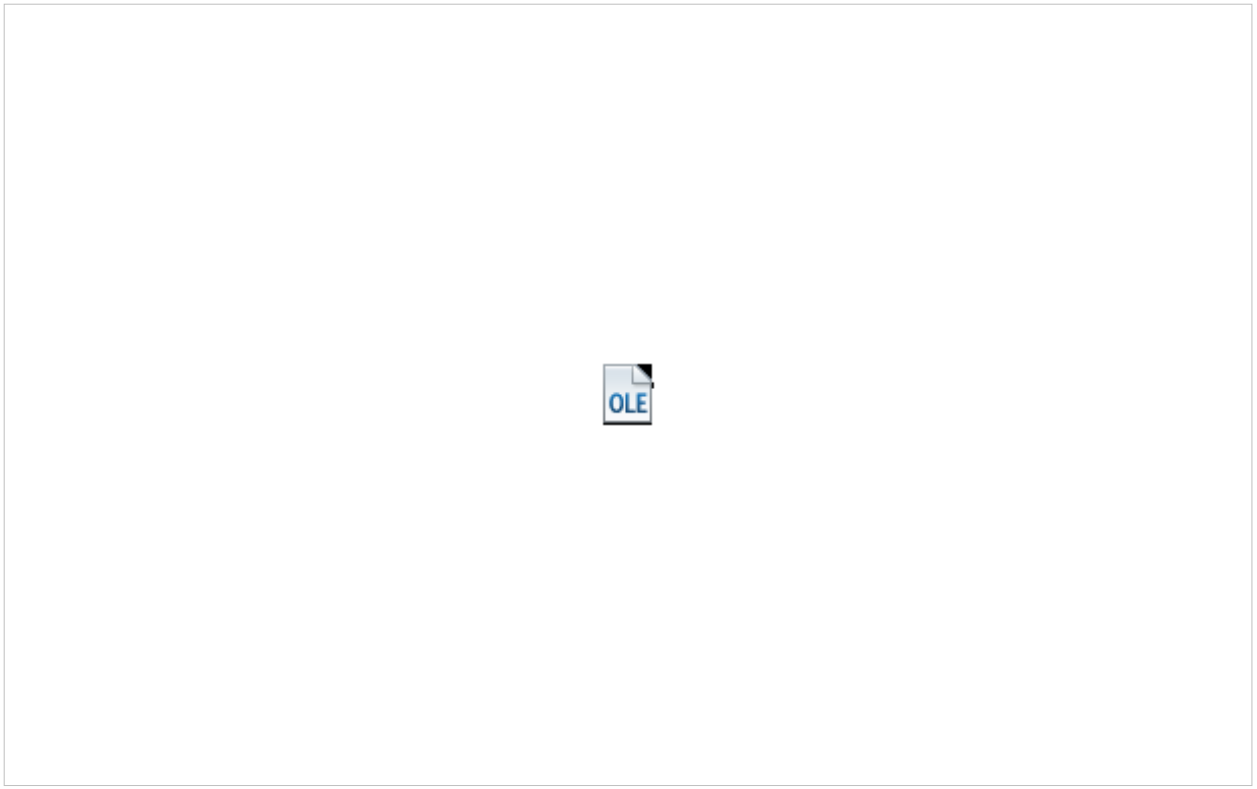
Simulated beam cross section at source position (0 cm in SHADOW referential system) for the X6A port. Energy range: 11.995 keV to 12.005 keV. Front end Beryllium windows not included. All units are in cm.

KB mirrors for X6A: a case study



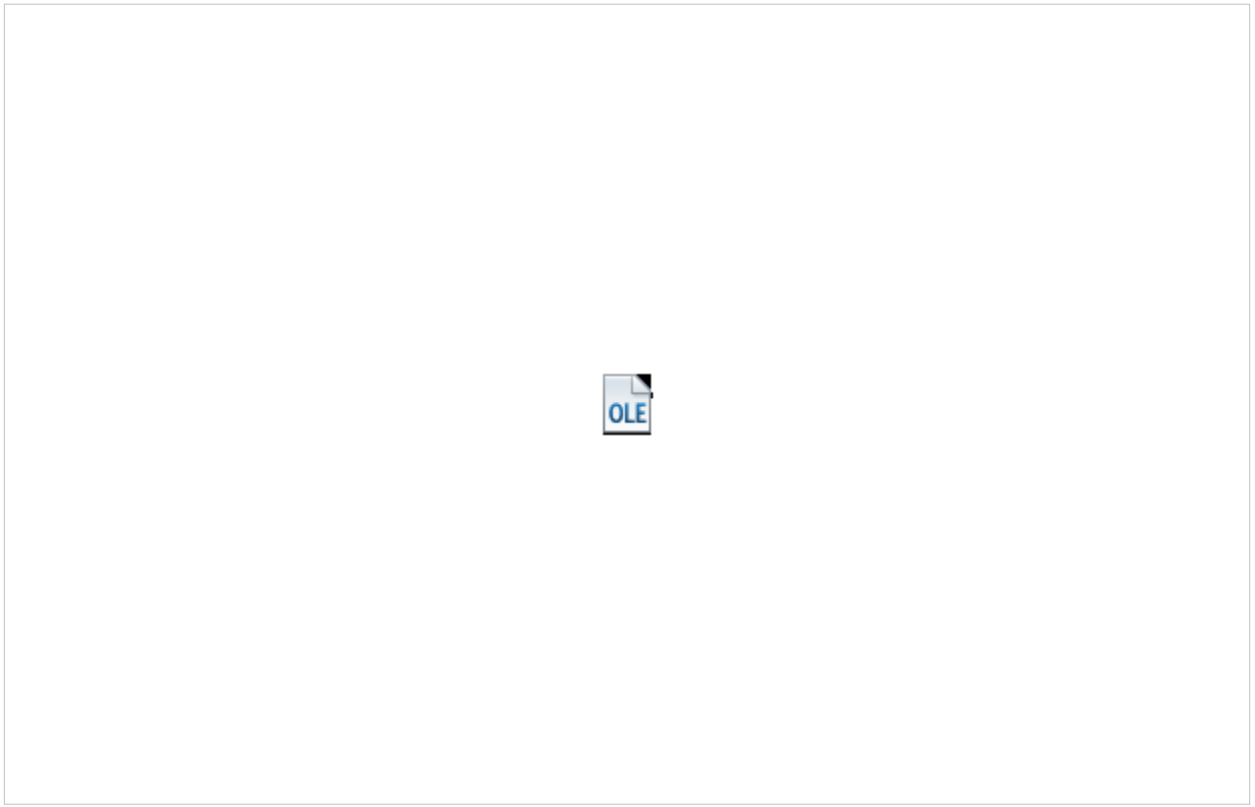
Beam cross section 10 cm after the Si [111] channel cut monochromator. E=12keV and diffraction angle= 9.48o. All units are in cm.

KB mirrors for X6A: a case study



Simulated beam cross section after the Rh toroidal mirror (500 cm) ; E=12keV and diffraction angle= 9.48o. All units are in cm.

KB mirrors for X6A: a case study



Simulated beam cross section after KB mirror assembly (at the second focus); E=12keV. All units are in cm. Beam on sample ~ 15 □ m (V) x 270

- m (H) (FWHM).

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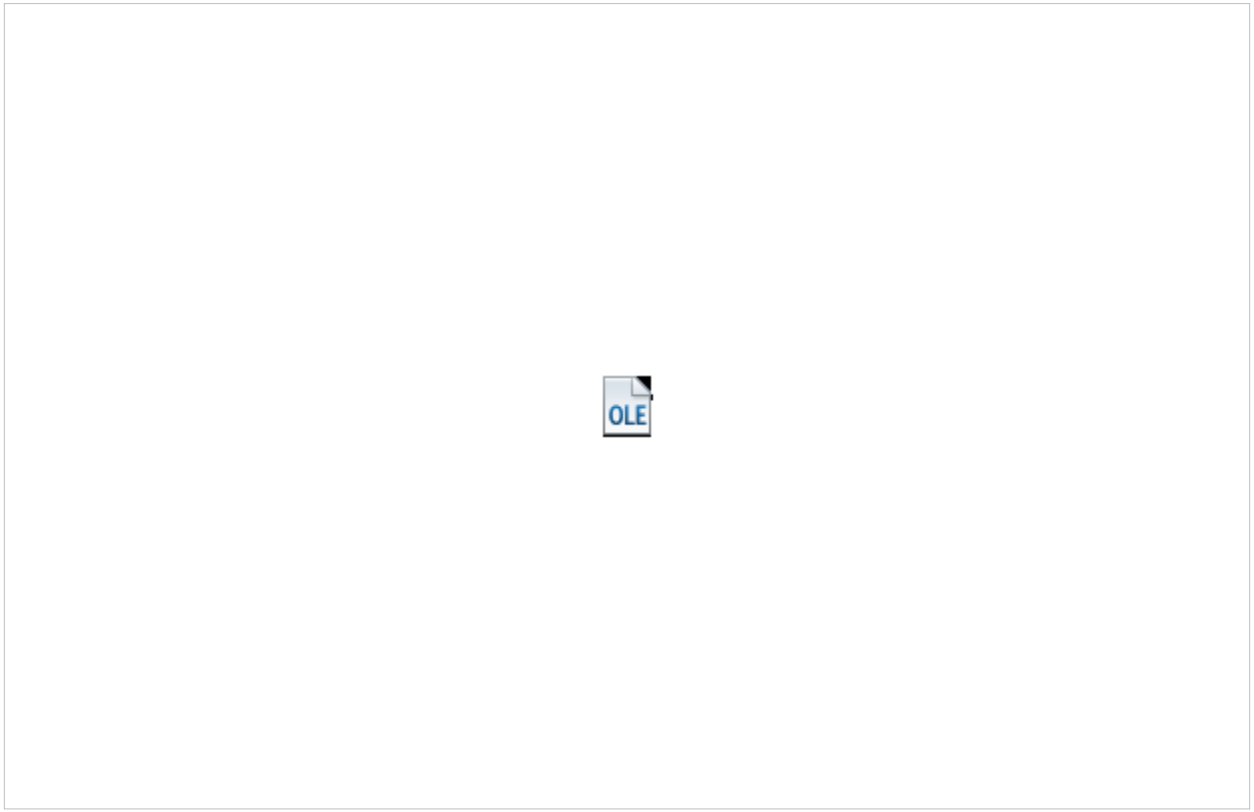
KB mirrors for X6A: a case study



Simulated beam cross section into at the sample position (into the hutch) for the current status of X6A at NSLS.. Energy: 12 keV. Units are in cm.

KB mirrors for X6A: a case study

KB assembly mirror characteristics

For a beam spot at sample position; ~ 15 ▪ m (V) x 270 ▪ m (H) (FWHM).

X6A

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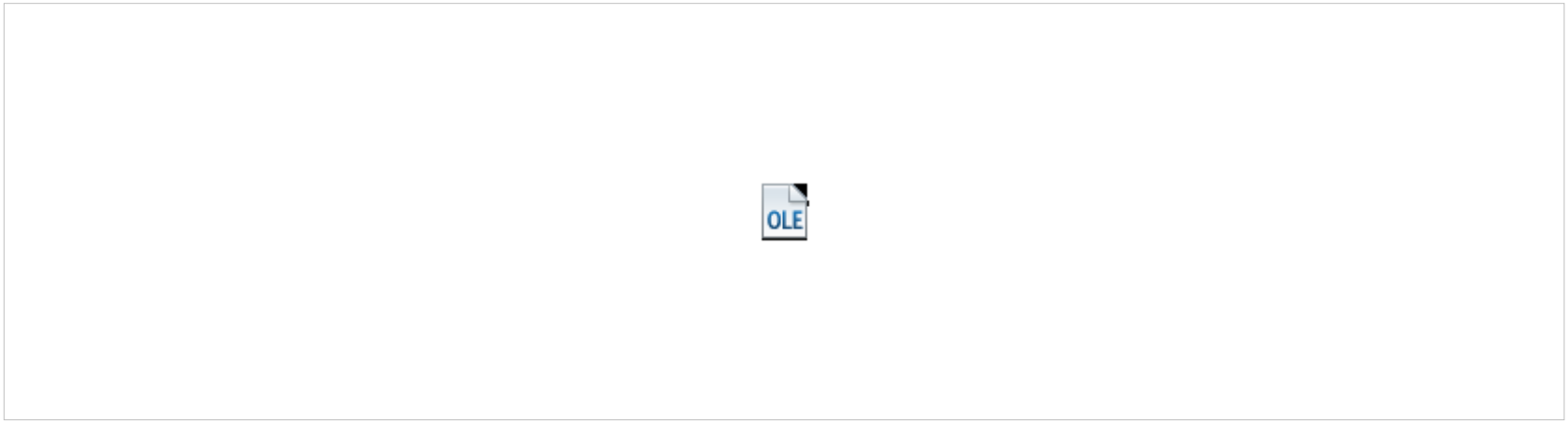
KB mirrors for X6A: a case study

By Marcelo Honnicke



The KB assembly will allow for a gain in flux of ~ **18 times /□ m2** if small samples are used.

Outlook

Many improvements were implemented in 2010. It kept the beam line up-to-date providing a user friendly environment.

For 2011 we are proposing further improvements to keep the beam line competitive and increase the ease of use.